Math 151

Show Your Work! Oct. 29, 2019 Name _____

Good Luck! Test #2 A (please print)

1. Calculate these 5 derivatives (Do **not** simplify once all derivatives are calculated.)

Show work & **circle your final answers**.

(a) $D(\ e^{x} \cdot \sin(\ x^{3})\ ) =$

(5 each)

(b) $D(\ \tan^{5}(2x+3)) =$

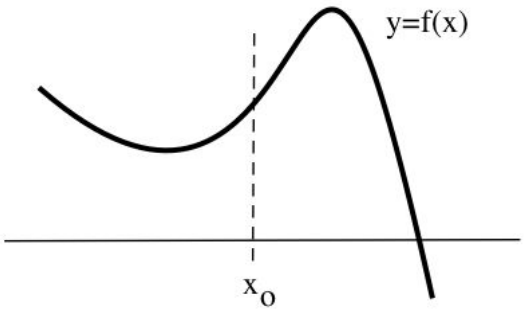
(c) $\dfrac{d}{dt}\left(\ \ln\left(e^{2t}+\cos(t)\right)\ \right) =$

(d) $\dfrac{d}{dt}\left(\dfrac{t^{3}+\sin(t)}{7+\cos(t)}\right) =$

(e) $f(x) = \sqrt{\cos(3x)+\sec(5x)}$. f '(x) =

(f) $g(x) = e^{2x}+\sin(3x)+\dfrac{1}{x}$ g ''(x) =

2. The figure shows the graph of f(x) and the location of x_0 .
Find and LABEL the locations of x_1 and x_2 obtained by using Newton's Method..



(3)

3. (a) The sequence x0, x1, x2, x3, … will always converge to a
(2) root of the function. True False (circle one)

(b) $f(x) = x^3 - x^2 + 4$. If we start with $x_0 = 1$,
then using Newton's Method

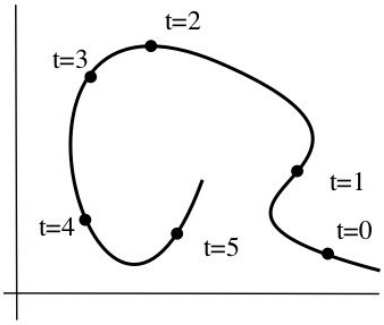
(4) x_1 =_____ , x_2 = _____ (2 decimal places)

4. (a) See the figure at the right, and use that information to fill in the blanks in the table with
POS, NEG, ZERO or UND when **t=3**.

dx/dt	dy/dt	dy/dx

(3)

(1) (b) When **t=1**, $\frac{dx}{dt}$ is POS, NEG, ZERO or UND



5. The location of an robot at time t minutes is x(t) = 4t + 3sin(t) , $y(t) = t^2 - 2\cos(t)$ meters. (RADIAN mode!)
(Round answers to TWO decimal places. UNITS!)

(2) (a) When t = 2 minutes, the location of the robot is. (,)

(9) (b) When t = 2 minutes, $\frac{dx}{dt}$ = _____ $\frac{dy}{dt}$ = _____ $\frac{dy}{dx}$ = _____

(3) (c) When t = 2 minutes, the SPEED of the robot is _____

6. Each answer should be a number. Use the table for the g and g ' values.

x	g(x)	g '(x)
0	2	–3
1	1	4
2	3	2
3	2	–1
4	1	0

(a) at x=2 D(g(3x–4)) = _____ (b) at x=3 D(g^3(x)) = _____

(c) at x=1 D($g(x^2-1)$) = _____ (d) at x=3 D($x \cdot g(x)$) = _____

(2 each)

7. A bug is crawling up and down on a pole (the y-axis marked in cm) , and the bug's height at time t minutes is $h(t) = t^3 - 6t^2 + 110$ cm . **(Be sure to include units with your answers.)**

(3) (a) What is the bug's velocity after 3 minutes? _____

(3) (b) When will the bug change directions? _____

(3) (c) How far will the bug crawl during the first 6 minutes? _____

(3) (d) What is the bug's acceleration when t=2 minutes? _____

8. The number of fish in the lake at time t weeks is $F(t) = 300 + 40\sin(t) + 60 \cdot e^{-0.5t}$.

How fast is the fish population changing when t = 4 ? _____

(4)

9. (a) $f(x) = \sqrt{x}$. Find the linear approximation L(x) of f(x) when x = 36. L(x) = _____

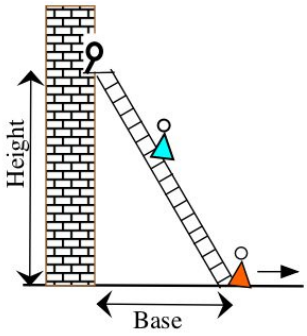
(b) Use your result in part (a) to approximate the value of $\sqrt{37.6} \approx$ _____ (3 decimal places)

(c) For this f(x) and at x=36, df = _____

(3) (3) (2)

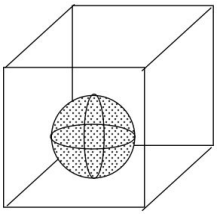
10. Do **2** of these problems. (If you do all three, I will only grade A and B.) UNITS !!

A. A young woman has placed a 25 foot long ladder against a house but her mother is pulling the bottom of the ladder away from the house at a rate of 3 feet per second. How fast is the top of the ladder falling when the bottom of the ladder is15 feet from the bottom of the wall? _____ (2 decimal places)



B. A cube (all edges are the same length) has edge length 8 cm and the edges are growing at 4 cm/ hour, A sphere is inside the cube. The sphere has radius 3 cm and the radius is increasing at 2 cm/hour. How fast is the volume inside the cube but outside the sphere changing? (sphere volume $V = \frac{4}{3}\pi R^3$)

_____ (2 decimal places)



C. A red car is 60 miles north of Bellevue and driving south at 30 miles per hour. A blue car is 50 miles east of Bellevue and driving east at 20 miles per hour. How fast is the distance between the cars changing? _____ (2 decimal places)

Problem A B C (circle one)

(6 each)

Problem A B C (circle one)

BONUS: (+1 if correct) What did Erdos do with the money he got from awards?

the end! (points = 101 + 1 bonus. Tests back tomorrow.)